Percutaneous Mechanical Circulatory Support Devices

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FINANCIAL DISCLOSURES

none
CASE STUDY
CASE STUDY

- 52 year old gentlemen
- Complaining of dyspnea after eating for one week
- Smallest amounts of food make him “bloated”
- He has been walking after meals to help relieve symptoms
  - becomes increasingly short of breath
  - develops significant palpitations
- Bedtime, becomes markedly SOB, must sleep sitting up
- Denies any dizziness or chest pain
• **NO** medical history
• **NO** previous surgeries
• Occasional drinker
• Occasional smoker
• Exercised regularly up until symptoms developed
• Takes only **omeprazole**… which had been providing relief
CASE STUDY

- June 4th, 2014..... sees his Cardiologist
  - Elevated right heart pressure
  - JVD
  - Ascitis
  - Suspects pulmonary hypertension

EMERGENCY ROOM!!
CASE STUDY

• CXR
  • unremarkable
• CT Results
  • pulmonary edema
• *Echo*
  • Severely abnormal left ventricle
  • Abnormal systolic function
  • End-stage cardiomyopathy
  • Ejection Fraction 5%
  • Global hypokinesis
CASE STUDY

June 6th, 2014

- Neo-synephrine
  - Brought *emergently* to Cardiac Cath Lab
- Dopamine
  - Barely responsive
- **Discolored**
- Intubated
  - Severely hypotensive
- Access
  - Bradycardia
CASE STUDY

Ejection Fraction 5%-10%
- LV-EDP 60 mmhg!!!
No significant obstructive CAD
BALLOON PUMP?
INTRA-AORTIC BALLOON PUMP

• Most widely used CIRCULATORY ASSIST DEVICE
• First used 40 years ago as a last result in patients in cardiogenic shock
• Today routinely used in a wide range of serious cardiovascular conditions
• Hemodynamic unstable patients
  • Acute myocardial infarction (AMI)
  • Cardiogenic shock
  • High risk patients undergoing PCI

INTRA-AORTIC BALLOON PUMP

Aorta
• ↓ systolic pressure, ↑ diastolic pressure

Left ventricle
• ↓ systolic pressure, ↓ end-diastolic pressure, ↓ volume, ↓ wall tension

Heart
• ↓ afterload, ↓ preload, ↑ cardiac output

The primary goal of IABP:

- Improve the ventricular performance
  - Facilitating an increase in myocardial oxygen supply
  - Decreasing myocardial oxygen demand.
- IABP may also have favorable effects on right ventricular (RV) function
  - Unloading the left ventricle
  - Causing reduction in left atrial and pulmonary vascular pressures
  - Decreases RV afterload.

INTRA-AORTIC BALLOON PUMP

IABP is not a *true* circulatory **support** device

• Not really a pump
• Does not contribute directly to cardiac output
  • Only rapidly deployable support device available for decades

THE BEST TREATMENT?
ASSISTANCE OR SUPPORT?
PERCUTANEOUS MECHANICAL CIRCULATORY SUPPORT (LEFT VENTRICULAR ASSIST DEVICES)
LVADS

Provide mechanical circulation when the heart cannot pump efficiently enough to maintain adequate cardiac output

*Used in the sickest patients:*

- End-stage heart failure
- Heart failure after cardiac surgery
- High-risk cardiac surgery
- Acute MI
- Severe Myocarditis
- Ventricular dysrhythmia
- High-Risk PCI

Thoratec PLC, ECMO

- Has always been reserved for emergency near-arrest situations.
- Significant morbidity and mortality associated with these devices.
- Restricted their use to potential transplant candidates.

LVADS

LVADS

Tandemheart

• Can be deployed in the cardiac cath lab.
• Can require a multitude of resources
  • TEE/ICE guidance
  • Specialized training

IMPELLA

• Worlds smallest pump
• Inserts like a pigtail catheter
IMPELLA

Indications

- Cardiogenic Shock
- STEMI/ Cardiogenic Shock
- STEMI/ Urgent CABG
- Acutely decompensated CHF patients

- Temporary mechanical support patients with multi-organ failure
- “Bridge to decision” or “Bridge to transplant”
- “Bridge to recovery”
- “High-Risk” PCI
IMPELLA

“High-risk” PCI

• Un-protected left main
• Single remaining vessel
• Compromised LV patients in cardiogenic shock
Why use it?
Inserts into femoral artery

- **13 Fr Sheath** (*Impella 2.5*)
  - 9 Fr catheter shaft
  - Up to 2.5 L/ Min.

- **14 Fr** (*Impella CP*)
  - 9 Fr catheter shaft
  - Up to 4 L/ Min.
IMPELLA

Protect 1 Trial

Determine safety and efficacy of placement

• Patients having high-risk PCI, all with poor ventricular function
• Device was placed successfully on all patients
• None became hemodynamically unstable
IMPELLA

PROTECT II TRIAL

Results:

**High-risk population that underwent PCI**

- Compared Impella with IABP
- Significantly lower MAE & MACCE at 90 days
  - **Major Adverse Events**
  - **Major Adverse Cardiac and Cerebral Events**
Study: STEMI complicated by cardiogenic shock on IABP

- No difference in 30-day mortality in patients with and without IABP
- No impact on 1-year mortality

IMPELLA

Stretch Trial

- 1511% ↑ in use of MCS
- Correlate ↓ Length of Stay
- ↓ Mortality
- ↓ Hospital Costs
- 25% ↑ Cost/ LOS associated with IABP
CASE STUDY
CASE STUDY

Impella CP was placed in Cardiac Cath lab MCVI
• Transferred to a transplant center
• A couple weeks post transfer
  • Surgeon removed Impella CP from groin
  • Replace with the Impella 5 - Axillary
  • Allowed patient mobility
• Inpatient for a little over 2 months
• Discharged back to a normal life
CONCLUSION

There are different choices & indications for LVADS

• No two patients are the same
• Operators decision
• Lots of data on the devices available

Making the right decision…what’s best for their patient.
Thank you